

Remarks

The examiner rejected claims 1-3, 5-9, 11-13, 16-19, 21-26, and 28-32 under 35 U.S.C. § 102(e) as being anticipated by the published U.S. patent application to Zhao et al. (Pub. No. US-2002/0185734 A1). The anticipation rejection applies to all pending independent claims (1, 6, 13, and 22). For Zhao to stand as an anticipating reference with regard to the rejected claims, it must disclose *each and every claimed limitation*. Zhao fails in that regard on several counts.

Zhao, in all its embodiments, discloses a chip carrier substrate, such as a flexible tape Ball Grid Array (BGA) carrier, to which top and bottom side “plates” may be added. Zhao generally refers to the topside plate as a “stiffener 112” (see, e.g., Fig. 2A) and refers to the bottom-side plate as a “ground/thermal connector 802” or as a “ground/thermal connector 1102” (see, e.g., Figs. 8 and 11, respectively). Zhao particularly focuses on the use of flexible tape substrates and the addition of Zhao’s stiffener and connector to that type of substrate allegedly improves its mechanical properties, i.e., its stiffness, and its thermal and electrical properties, if the stiffener and connector are electrically and thermally conductive.

Thus, Zhao discloses a carrier substrate *assembly* that comprises a potentially flexible substrate with a separate stiffener bonded to its topside and a separate connector bonded to its bottom side. Much of Zhao’s disclosure is devoted to describing the assembly processes required to create the disclosed substrate assembly, e.g., see Figs. 14-19 and the accompanying text. Simply put, Zhao begins with a potentially flexible substrate and then bonds a topside stiffener and bottom-side connector to that substrate to allegedly add stiffness to it and improve its electrical and thermal properties.

As one point of direct contrast to Zhao, the instant application discloses and claims a one-piece chip carrier substrate that includes an integral topside ground plane and, optionally, includes an integral bottom-side ground plane. Here, the claimed ground planes comprise inseparable layers of the substrate, which may include additional inner layers much like a

printed circuit board. With this arrangement, the applicant presents and claims a carrier substrate that offers excellent thermal/electrical performance and inherent stiffness, while obviating the need for Zhao's explicit addition of separate stiffeners, etc.

Another difference that rebuts the examiner's assertion of anticipation is that claims 1, 6 and 13 further specify that ground pads are formed within the bottom side ground plane. Applicant notes that the bottom side connector of Zhao is a separately attached metal plate that would prohibit the formation of such pads "within" the area defined by the attached plate. By definition, then, Zhao cannot anticipate such claims as Zhao does not teach that claim limitation.

Because of these and other fundamental differences between Zhao and the instant invention, the applicant believes that the examiner's anticipation rejections must be withdrawn. However, to better distinguish the applicant's claimed invention from Zhao, several claim changes were made by amendment herein. The examiner is directed to foregoing claim set in which the applicant amended independent claims 1, 6, 13 and 22, amended dependent claims 2, 3, 8, 11, 14-16, 19, 20, 23, 24, 26, 27 and 31, cancelled claims 4, 9, 10 and 32-35, and added new claims 36-38.

In particular, the applicant changes independent claims 1, 6, 13, and 22, and their dependents (where required), to identify that the claimed ground planes are integrally formed as etched layers of the carrier substrate. For example, claims 1, 6, and 13 now identify the ground planes as being etched ground planes comprising top and bottom layers of the substrate. Similarly, claim 22 now claims a "one-piece" substrate that includes top and bottom conductive layers that are etched to form topside and bottom side ground planes, respectively.

In the context of these amendments, "etched" connotes a conductive planar layer that is integrally connected or formed on or between non-conductive substrate layers, and that may have selected planar areas removed to create electrically or thermally isolated features within or around that integrally formed layer. The applicant believes that these changes provide clearer

distinction between the Zhao reference and the claimed invention, and respectfully requests reconsideration of such amended claims.

The applicant additionally notes that claims 11 and 22, along with new claim 36, include novel die grounding details that are not taught by Zhao. Support for such a grounding connection is found in the originally filed specification at page 3, line 3, wherein it states:

By providing a top-side ground plane covering the die mounting area, die grounding is accomplished through mounting the die in electrical connection with the ground plane. This eliminates the need for using one or more bond wire connections to ground the die. Thus, all bond wires may be dedicated to signal connections.

Further support for the claimed die grounding arrangement is found in the specification at, for example, page 4, line 12, wherein it states:

The die 12 further includes one or more ground connections on its bottom side, for making ground connection with the carrier 14. The die 12 is mounted to a top side 26 of the carrier 14, and is protected by a mold compound 20 formed over it. The mold compound 20 covers the die 12, sealing the die 12 against the carrier 14, and providing mechanical and environmental protection for the die 12 and its bond wires 18.

Thus, the claimed die-carrier grounding arrangement, which Zhao in fact teaches away from by making clear that die grounding in Zhao is effected by bond wire connection to the stiffener, finds full support in the specification as filed.

Further, as the applicant believes that the examiner's anticipation rejections of the independent claims are overcome, the examiner's obviousness rejections of one or more of the dependent claims are rendered moot. However, the applicant specifically rebuts the examiner's line of argument used to reject dependent claims 4, 10, 14-15, 20, 27 and 33-35 under 35 U.S.C. § 103(a) as being unpatentable over Zhao in view of U.S. Pat. No. 6,380,633 to Tsai.

In this line of argument, the examiner attempts to incorporate the "patterned circuit layers" of Tsai into the separate stiffener and connector of Zhao. For example, the examiner argues that Tsai's alleged teaching of "hatching" printed circuit layers could be applied to Zhao and thereby yield "hatched" (perforated) stiffeners and connectors. The applicant notes that

applying such hatching to Zhao's stiffener and conductor would destroy the sought-after mechanical rigidity (stiffness) of those items, and would introduce substantial additional manufacturing complexity. Those skilled in the art would recognize such difficulties and would have no motivation to attempt any such combination.

Finally, the applicant notes the examiner's objection of informalities in claim 2. The amended claim 2 above addresses the cited informalities and should thus place claim 2 in condition for allowance.

In summary, the applicant believes that the arguments and amendments herein overcome the examiner's anticipation rejections with respect to Zhao, and render moot the examiner's further obviousness rejections with respect to the attempted combination of Zhao and Tsai. As such, the applicant believes that all pending claims now stand in condition for allowance and respectfully requests reconsideration as such by the examiner. If the examiner has any questions or concerns regarding this matter, he is encouraged to call the undersigned agent.

Respectfully submitted,

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